

STIMULUS AND MEMORY.

Die Mneme als erhaltendes Prinzip im Wechsel des organischen Geschehens. By Richard Semon. Pp. xiv+353. (Leipzig: Wilhelm Engelmann, 1905.) Price 6s. net.

LITTLE as it may appear from the title, this work is really an inquiry into some of the remoter effects of stimulation. Thus, every stimulus applied to organic substance—whether that substance be nervous, or not nervously differentiated—produces not only its appropriate reaction, but also an altered condition of the substance itself, so that even when the immediate effect of the stimulation has subsided, the second “condition of indifference” is different from the first. The substance may now, for example, readily react to stimuli which before were insufficient to produce any appreciable effect, or it may respond to a stimulus connected only by association with the stimulus usually necessary. It pleases this author to read and group these facts anew, and to apply to them a terminology that will correspond with the novelty of the grouping. Hence he calls the enduring effect of the stimulus an *engramm*; the stimulus is said to operate *engraphically* on the substance, or to produce an engraphic alteration. Again, when stimulus B, differing in quality or quantity from stimulus A, still succeeds with the aid of the *engramm* in producing a reaction appropriate to A, it is said to operate *ecphorically*, or the new state of excitation is said to be produced by the *ecphory* of the *engramm*. Obviously ordinary memory may be brought under this wide class of phenomena, and the author might have used the term memory to describe these facts; but, to avoid misunderstanding, he has chosen the term *mneme* instead. Hence we read of such things as *mnemic* excitation, *e.g.* in the case mentioned above when stimulus B is applied.

The situation is well summed up on p. 89:—

“We recognise the presence of an *engramm* by the circumstance that for the discharge of the appropriate reaction the appearance of the original unaltered stimulus is no longer necessary, but the appearance either of the original stimulus altered quantitatively or qualitatively, or of a stimulus which works *ecphorically* on an associated *engramm*, or the expiration of a definite period of time (*chronogenous ecphory*), or finally the appearance of a definite phase of development in the continuous series of successive generations (*phasogenous ecphory*).”

Herr Semon on these lines proceeds to discuss the facts of acclimatisation and instinct, the inheritance of acquired characteristics, and the like, and to translate them into his peculiar language. Thus, when according to Mr. Claypole (as reported by Prof. Lloyd Morgan) young ostriches hatched in an incubator pick up food thrown before them only after someone has “dabbed” with his finger on the ground in their presence, our author’s interpretation is that we have here the *ecphory* of an inherited *engramm*, an *engramm* the appropriate reaction of which is pecking; the *ecphoric* stimulus in this case is the return of the primary stimulus (pecking on the part of the mother hen) altered to some extent qualitatively.

The limits of space forbid a full account or discussion of many interesting questions raised by Herr Semon. In the second part of the book he deals with the mutual relations of *engramms*, their localisation, the *mnemic* conditions of excitation, and *mnemic* homophony. By *mnemic* homophony is meant “the process by which *mnemic* excitation and fresh original excitation are, so to speak, made to coincide, and by which each disagreement between the two produces a perceptive reaction.” The third part discusses the reality of *mnemic* processes in “*ontogenesis*.” In the fourth the author deals with various objections, and claims for *Mneme* that it is a necessary preservative principle which protects the transformations continually produced by the external world. He claims, also, that it helps us to an understanding of the law of which Haeckel is the unwearying exponent, *viz.* that the individual passes through the same stages of development as the whole species to which it belongs.

The author seems a competent reasoner and observer. His work is interesting and suggestive, and opens a fruitful field for discussion.

ECONOMY IN THERMAL POWER PLANTS.

Commercial Economy in Steam and other Thermal Power Plants as Dependent upon Physical Efficiency, Capital Charges, and Working Costs. By Prof. Robert H. Smith. Pp. xxiv+291; with numerous diagrams by H. Malcolm Hodson. (London: Constable and Co., Ltd., 1905.) Price 24s. net.

THE aim of this work is to deduce sufficiently accurate laws for determining the most efficient power plant when all-round economy is taken into account. For this purpose it is necessary to determine a standard of economy, and this is fully discussed in the opening chapter, where a coefficient is defined depending upon the value of the product directly and on the cost and time inversely. The application of this standard to measure the efficiency of production is applied to some examples, and the results of the analyses are considered in detail. After a discussion of the properties of steam, the efficiencies of engines and boilers, and questions of a kindred nature, the author proceeds to deal with the interesting question of the cost of various forms of thermal power plant.

The data for this chapter have been drawn from various sources, principally from makers’ catalogues, and are exhibited in graphical form for heat engines by plotting capital or annual costs as ordinates against final cylinder volumes or brake horse-power as abscissæ. In this way very interesting relations are established, which can generally be approximately represented by straight-line laws with sufficient accuracy to form a fair estimate of cost. Thus for Crossley gas engines up to 500 horse-power with Dowson gas producers, the capital cost, including the building, is given as $300 + 10.8T$, where T is the

brake horse-power, while for a corresponding plant using Diesel oil engines the formula is $300+10T$. The annual costs for a year of 2700 working hours for these are stated as $200+3.7T$ and $110+2.9T$ respectively.

Steam engines are treated in like manner; thus in the case of a high-speed tandem compound engine the price is found to be represented by

$$140+0.05S-\frac{30,000}{240+S}$$

where S is the final volume of the steam in cubic inches swept out by the low-pressure piston per stroke. Formulæ are developed for boilers in terms of E , the evaporative power in pounds of water per hour, and the pressure, p , in pounds per square inch; thus the price of Lancashire boilers in pounds sterling is expressed by $110+(0.016+0.0003p)E$.

The information brought together in this section has evidently involved much labour, and it should prove extremely useful. The remaining half of the book is devoted to questions involving a considerable acquaintance with thermodynamics, in which the author introduces several new terms, such as "trans-power" (p. 155), to signify the time rate of transmission of energy, "dynothermic coefficient" (p. 229), defined as the "ratio of resilience to heat transmission creating it."

Great stress is laid on the irreversible character of practical heat-engine cycles, and the author's views may be judged by his remarks on p. 178, where he says:—

"The conditions of life require rapid work, so that the sooner we give up worshipping reversibility as a fetish worthy to be aspired after and approximated to, the better will we succeed in engineering."

The dependence of maximum economy upon size, indicator diagram, initial and back pressure, working speed, and furnace temperature are all dealt with in detail, and combinations of the best values for effecting economy are considered by graphical methods.

The complex nature of the problems attacked make this part of the book decidedly hard reading, and the difficulty is much increased by the author's notation. The book is well illustrated by diagrams drawn by Mr. H. M. Hodson.

E. G. C.

MATERIA MEDICA.

A Text-book of Materia Medica for Students of Medicine. By C. R. Marshall, M.D. Pp. xi+635. (London: J. and A. Churchill, 1905.) Price 10s. 6d. net.

THE compilation of a satisfactory text-book of materia medica is a somewhat difficult task, since the author should, at least in an ideal text-book, be equally conversant with the chemistry of drugs, the botany of those which are of vegetable origin and the therapeutics of all. Dr. Marshall has been singularly successful in preserving in this book an even balance between these various divisions into which the subject naturally falls.

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The arrangement adopted, which differs somewhat from those commonly employed in text-books or *materia medica*, is to be commended. The first portion deals with the inorganic substances used in medicine, then a chapter is devoted to the synthetic products which have of recent years assumed so important a position as remedial agents, including anti-pyrine, phenacetin, sulphonal, &c., and finally about 300 pages are occupied with the description of drugs of vegetable or animal origin. The method of grouping these drugs is roughly that of the nature of the "active principles" they contain, so that the subject appears as a fairly coherent whole instead of as a set of isolated groups of facts, which is the case when the method of treatment adopted is that of the botanical relationships of the plants from which the drugs are obtained. The descriptions given of the various drugs of vegetable origin are clear, and though concise are sufficient for purposes of recognition, especially when used in conjunction with the carefully executed illustrations, which are one of the best features of the book.

In spite of the care which has evidently been taken, both in the actual compilation and in the "proof" reading, there are a few inaccuracies and doubtful statements still existent in the text to which reference may be made. It is not quite accurate to say that "no authentic case of antagonistically-acting alkaloids occurring in the same plant is at present known" (p. 6), since aconitine and aconine, which are stated (p. 330) both to occur in the root of *Aconitum Napellus*, have been shown to possess opposed physiological activities. Podophyllin is not, as suggested (p. 8), a "neutral principle," which, when used in the ordinary sense, means a single definite substance, but is a mixture of resins. The reference to the "theoretically possible number of terpenes" (p. 11) is misleading, since the number cannot be computed with our present knowledge of these bodies. Gums are not, as stated (p. 15), carbohydrates, and this statement does not harmonise with that given later (p. 16), that arabin, the chief constituent of gum arabic, is a mixture of salts of organic acids. Potassium hydroxide "can be handled with safety" (p. 111) is, to say the least, not a wise saying to place before students. Milk sugar (lactose) is wrongly described (p. 233) as not fermentable.

On general grounds exception may be taken to such a loose and carelessly worded statement as "on the differences in solubility of alkaloids is based the principle of standardisation" (i.e. of drugs and galenical preparations of these), and to such a sentence as "hyoscine and scopolamine have a somewhat different constitution to atropine and hyoscyamine."

Such blemishes as are referred to in the preceding paragraphs do not, of course, seriously detract from the excellence of the book taken as a whole, and it may be recommended to students as a safe guide to modern *materia medica*, at least in so far as this has received official recognition by the British Medical Council.

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